

HP StorageWorks Modular Smart Array 500 System

Maintenance and Service Guide

(formerly Smart Array Cluster Storage System)



October 2003 (Fourth Edition)
Part Number 251850-004

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About This Guide

This maintenance and service guide can be used for reference when servicing the HP StorageWorks Modular Smart Array 500 system.



WARNING: To reduce the risk of personal injury from electric shock and hazardous energy levels, only authorized service technicians should attempt to repair this equipment. Improper repairs can create conditions that are hazardous.

Audience Assumptions

This guide is for service technicians. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazard in products with hazardous energy levels and are familiar with weight and stability precautions for rack installations.

Technician Notes



WARNING: Only authorized technicians trained by HP should attempt to repair this equipment. All troubleshooting and repair procedures are detailed to allow only subassembly/module-level repair. Because of the complexity of the individual boards and subassemblies, no one should attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.



WARNING: To reduce the risk of personal injury from electric shock and hazardous energy levels, do not exceed the level of repairs specified in these procedures. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create conditions that are hazardous.



WARNING: To reduce the risk of electric shock or damage to the equipment:

- Disconnect power from the system by unplugging all power cords from the power supplies.
 - Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
 - Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
-



CAUTION: To properly ventilate the system, you must provide at least 7.6 cm (3.0 in) of clearance at the front and back of the system.



CAUTION: The equipment is designed to be electrically grounded (earthed). To ensure proper operation, plug the AC power cord into a properly grounded AC outlet only.

NOTE: Any indications of component replacement or printed wiring board modifications may void any warranty.

Where to Go for Additional Help

In addition to this guide, the following information sources are available:

- *HP StorageWorks Modular Smart Array 500 System User Guide*
- *HP StorageWorks Modular Smart Array 500 System Hardware Configuration and Installation Poster*
- *HP StorageWorks Modular Smart Array 500 Controller Installation Instructions*
- *HP DC Power Supply Option Installation Instructions*
- *HP 4-Port Shared Storage Module Option Installation Instructions*
- *Operating System and Drivers Manual Installation Guide*
- Documentation CD
- *Service Quick Reference Guide*
- Service training guides
- Service advisories and bulletins
- QuickFind information services
- Insight Manager software

Telephone Numbers

For the name of the nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.

For HP technical support:

- In the United States and Canada, call 1-800-652-6672.
- Outside the United States and Canada, refer to

www.hp.com

Illustrated Parts Catalog

Mechanical and System Components

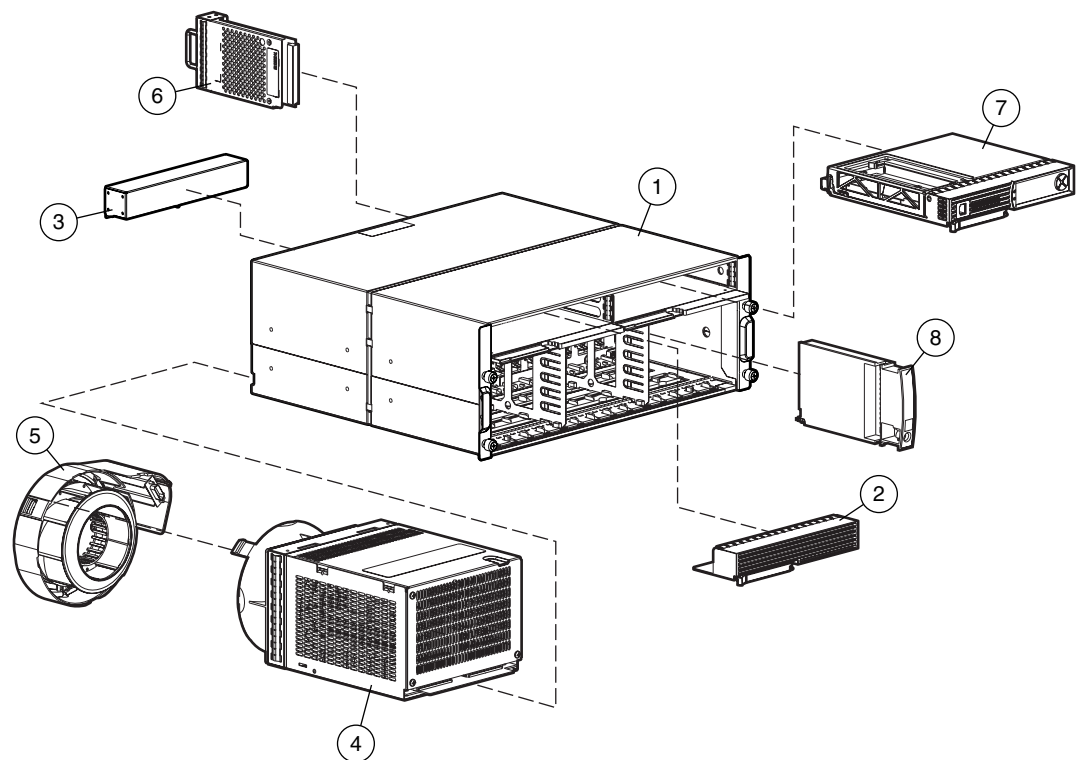


Table 1-1: Mechanical and System Components

Item	Description	Spare Part Number
Mechanical Components		
1	Chassis, 4U, with backplane	229198-001
2	Bezel blank	229208-001
3	Interconnect blank	229200-001
System Components		
4	AC power supply assembly, 499 W	212398-001
5	Blower	123482-001
Boards		
6	2-Port Shared Storage Module for HP StorageWorks Modular Smart Array 500 system	229205-001
7	Controller	229202-001
8	Power button/LED assembly	229201-001
9	Cache module, DIMM, SDRAM, 128 MB, with battery *	171387-001
Miscellaneous		
10	AC power cord *	187335-001
11	Return kit *	249670-001
Options		
12	4-Port Shared Storage Module for MSA500 system *	300867-001
13	DC power supply, -48 V *	243791-001
14	Cache module, DIMM, SDRAM, 256 MB, with battery *	262012-001
15	Universal hard drive, 1-inch *	177986-001
16	Universal Hot-Plug Tape drives *	
	a) AIT, 50/100-GB capacity	190716-001
	b) AIT, 35/70-GB capacity	218575-002
	c) DDS-4, 20/40-GB capacity	230203-001
17	M-Series Rack Rail option *	314635-001
* Not shown		

Removal and Replacement Procedures

To service the MSA500 system, you may need the following tools:

- Flat-blade screwdriver
- From the SmartStart CD:
 - Advanced Diagnostics Utility (ADU)
 - ROM Update Utility

Safety Considerations

Before performing service procedures, review all the safety information.

Preventing Electrostatic Discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Rack Warnings and Cautions



WARNING: Because the rack allows stacking of computer components on a vertical rather than horizontal plane, be sure that precautions have been taken to provide for rack stability and safety. It is important to follow these precautions providing for rack stability and safety, and to protect both personnel and property. Heed all cautions and warnings throughout the installation instructions provided with the device.



WARNING: To reduce the risk of personal injury or damage to the equipment:

- Observe local occupational safety requirements and guidelines for heavy equipment handling.
 - Obtain adequate assistance to lift and stabilize the product during installation or removal.
 - Always load the heaviest item first, and load the rack from the bottom up. This makes the rack bottom-heavy and helps prevent the rack from becoming unstable.
 - Extend the leveling jacks to the floor.
 - Rest the full weight of the rack on the leveling jacks.
 - Attach the stabilizing feet to the rack if it is a single-rack installation.
 - The racks are coupled together in multiple-rack installations.
 - Fully extend the bottom stabilizers on the equipment. Be sure that the equipment is properly supported/braced when installing options and boards.
 - Be sure that the rack is adequately stabilized before extending a component outside the rack. Extend only one component at a time. A rack may become unstable if more than one component is extended for any reason.
 - Do not attempt to move a fully loaded equipment rack. Remove equipment from the rack before moving the rack.
 - At least two people are needed to safely unload the rack from the pallet. An empty 42U rack weighs 115 kg (253 lb), is over 2.1m (7 ft) tall, and may become unstable when being moved on its casters. Do not stand in front of the rack as it rolls down the ramp from the pallet; handle it from the sides. Stabilize the device by keeping the unit on the rails.
-

Device Warnings and Cautions

Before installing a system, be sure that you understand the following warnings and cautions.



WARNING: To reduce the risk of personal injury or damage to the equipment, observe all warnings and cautions throughout this chapter.



WARNING: Do not exceed the level of repair specified in the procedures in the product documentation. All troubleshooting and repair procedures are detailed to allow only subassembly or module-level repair. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.



WARNING: Be sure that the AC power supply branch circuit that provides power to the rack is not overloaded. Not overloading AC power to the rack power supply circuit reduces the risk of personal injury, fire, or damage to the equipment. The total rack load should not exceed 80 percent of the branch circuit rating. Consult the electrical authority having jurisdiction over your facility wiring and installation requirements.



WARNING: To reduce the risk of personal injury or damage to the equipment, the installation of options other than hot-plug power devices should be performed only by individuals who are qualified in servicing computer equipment and trained to deal with products capable of producing hazardous energy levels.



WARNING: To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Unplug the power cord from the power supply to disconnect power to the equipment.
- Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord extends from the system.
- Do not use conductive tools that could bridge live parts.
- Remove all watches, rings, or loose jewelry when working in hot-plug areas of an energized device.



WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.



CAUTION: Protect the device from power fluctuations and temporary interruptions with a regulating uninterruptible power supply (UPS). This device protects the hardware from damage caused by power surges and voltage spikes, and keeps the system in operation during a power failure.

Weight Warning



22.7 kg

50 lb

WARNING: The MSA500 system weighs 22.7 kg (50 lb) when assembled for shipping. To reduce the risk of personal injury or damage to equipment:

- Observe local health and safety requirements and guidelines for manual material handling.
- Obtain adequate assistance to lift and stabilize the MSA500 system during installation or removal.
- Remove all tape drives, if installed, to reduce the overall weight of the system.

System Power Down



WARNING: To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the system. The front panel Power On/Standby button does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.

IMPORTANT: If installing a hot-plug device, it is not necessary to power down the system.

To power down the system:

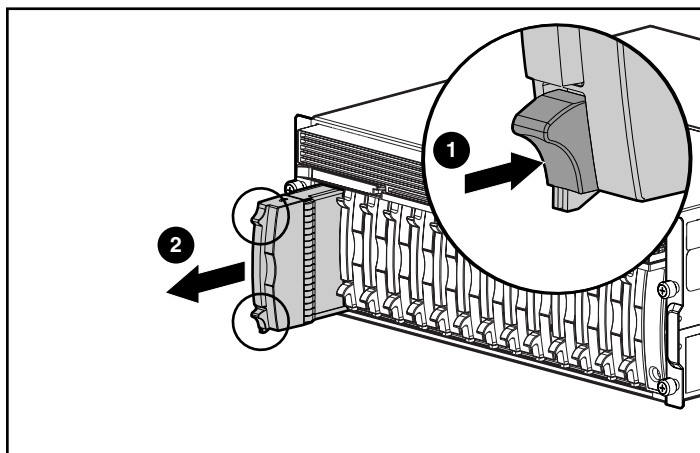
1. Power down any attached servers. Refer to the server documentation.
2. Press the Power On/Standby button. Wait for the system power LED to go from green to off.
3. Disconnect the power cords.

Hard Drive Blank



CAUTION: Always populate drive bays with either a hard drive or blank. Proper airflow can only be maintained when the bays are populated. Operating the system with unpopulated drive bays can lead to improper cooling and thermal damage.

To remove the component:



To replace a blank, slide the blank into the bay until it locks into place.

Hot-Plug SCSI Hard Drive



CAUTION: If you must replace a hot-plug drive, follow the guidelines in this section. Failure to do so can result in data loss and can void the warranty.

RAID 0 is not a fault-tolerant configuration. Never remove a drive from a RAID 0 array unless it has failed. Drive failure is indicated by an amber drive failure LED. In a RAID 0 configuration, removal of an operating drive results in data loss. To remove a drive without losing data, always back up the entire array, replace the drive, and restore the entire array. Backing up a single drive and replacing it does **not** restore the array.

Some instances exist in which you may replace a drive in RAID 1, 5, and Advanced Data Guarding configurations. To determine when drive replacement is possible without data loss, use the hot-plug SCSI hard drive LEDs combination table in Chapter 4, “Component Identification.”

Follow these additional guidelines when replacing drives:

- **Never remove more than one drive at a time (or two drives if you are using Advanced Data Guarding).** When you replace a drive, the controller uses data from the other drives in the array to reconstruct data on the replacement drive. If you remove more than one drive, a complete data set is not available to reconstruct data on the replacement drive(s) and permanent data loss could occur.
- **Never remove a drive while the controller is rebuilding another drive.** A drive's online LED flashes green while it is being rebuilt. The controller requires the data from all other drives to rebuild the replacement drive.
- **If the system has an online spare drive, wait for it to complete rebuilding before replacing the failed drive.** When a drive fails, the online spare becomes active and begins rebuilding as a replacement drive. After the online spare has completed Automatic Data Recovery (the online LED is continuously lit), replace the failed drive with a new replacement drive. Do not replace the failed drive with the online spare. The system automatically rebuilds the replacement drive and resets the spare drive to an available state.
- **If you replace a drive while the system is off, it may be necessary to rebuild the replaced drive.**

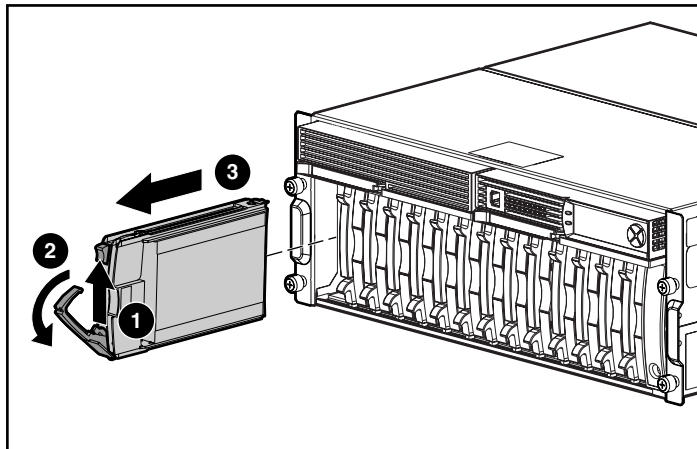
To remove the component:

1. Be sure that the online and activity LEDs on the failed drive are both off.



CAUTION: To prevent improper cooling and thermal damage, do not operate the system unless all bays are populated with either a component or a blank.

2. Remove the failed drive.



To replace a hot-plug SCSI hard drive:

1. Slide the drive into the bay until it locks into place.
2. Close the lever.



CAUTION: Data loss can occur if the drive is not firmly seated.

3. Be sure that the drive LEDs illuminate one at a time and then turn off together to indicate that the system has recognized the new drive.

In fault-tolerant configurations, allow the replacement drive to be reconstructed automatically with data from the other drives. While reconstruction is in progress, the online LED flashes.

Universal Hot-Plug Tape Drive

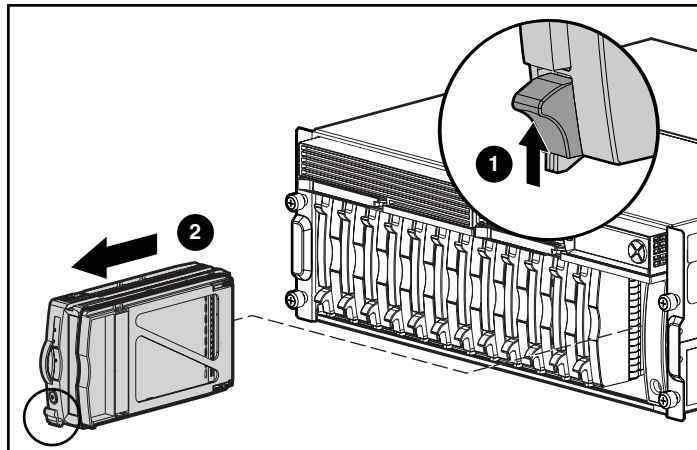
To remove the component:



CAUTION: To prevent improper cooling and thermal damage, do not operate the system unless all bays are populated with either a component or a blank.



CAUTION: Installation of the tape drive height converter is permanent. Attempting to remove the converter after installation voids the tape drive warranty.



To replace the Universal Hot-Plug Tape drive:

1. Install a new tape drive height converter on the replacement tape drive.
2. Slide the tape drive into the bay until it locks into place.



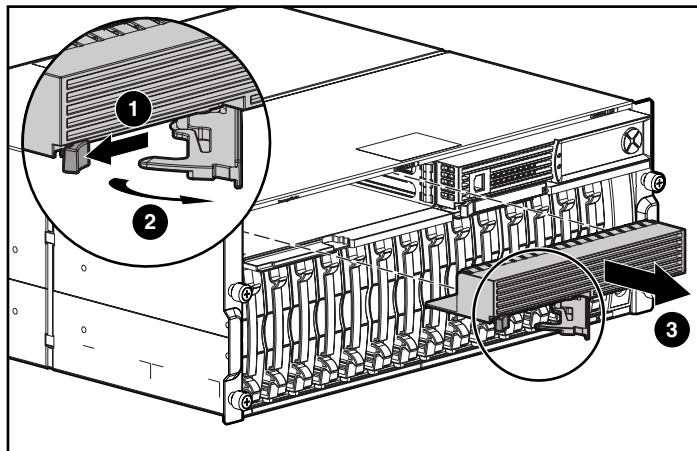
CAUTION: Data loss can occur if the drive is not firmly seated.

Bezel Blank

To remove the component:



CAUTION: Always populate bays with either a component or blank. Proper airflow can only be maintained when the bays are populated. Operating the system with unpopulated bays can lead to improper cooling and thermal damage.



To replace the bezel blank:

1. Slide the bezel blank into the bay until it locks into place.
2. Close the lever.

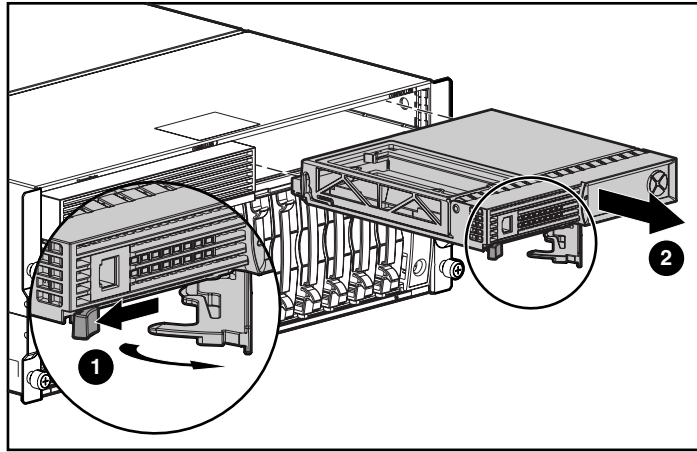
HP StorageWorks Modular Smart Array 500 Controller

When the MSA500 controller in a single-controller system fails, HP recommends that you migrate the cache module to a new controller. Battery-backed cached data in a failed controller can remain intact for up to 3 days with 256-MB modules or up to 4 days with 128-MB modules.



CAUTION: Failure to migrate the cache to a new controller and flush the data can result in loss of the data that is written in the cache but was unable to be written to the hard drives before controller failure.

To remove the component:



To restore the data:

1. Remove the cache modules from the failed controller. Refer to “Battery-Backed Cache Module” in this chapter.
2. Install the cache modules in the new controller.
3. Install the new controller and allow the cache to write the stored data.

To replace the controller:

1. Slide the controller into the bay until it locks into place.
2. Close the lever.
3. Verify that the controller is seated properly by observing the controller LEDs. When seated properly, the LEDs illuminate when the system is powered.

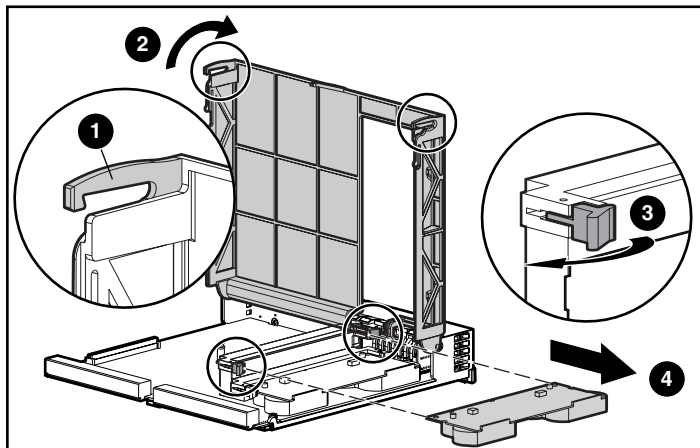
Battery-Backed Cache Module



CAUTION: To prevent data loss or equipment damage, follow the instructions in this procedure.

To remove the component:

1. Determine if the controller configuration supports hot-plug cache replacement:
 - If the system is equipped with a single controller, power down the system before performing step 2. Refer to “System Power Down” in this chapter.
 - If the system has redundant controllers and the replacement cache is a different capacity than the failed cache, power down the system before performing step 2.
 - If the system has redundant controllers and the replacement cache is the same capacity as the failed cache, proceed with step 2.
2. Remove the controller. Refer to “HP StorageWorks Modular Smart Array 500 Controller” in this chapter.
3. Remove the cache module.



4. Repeat steps 2 and 3 if the system has redundant controllers and the replacement cache is a different capacity than the failed cache.

To replace the cache module:

1. Install the module in the slot.
2. Close the slot latches.
3. Close the controller.

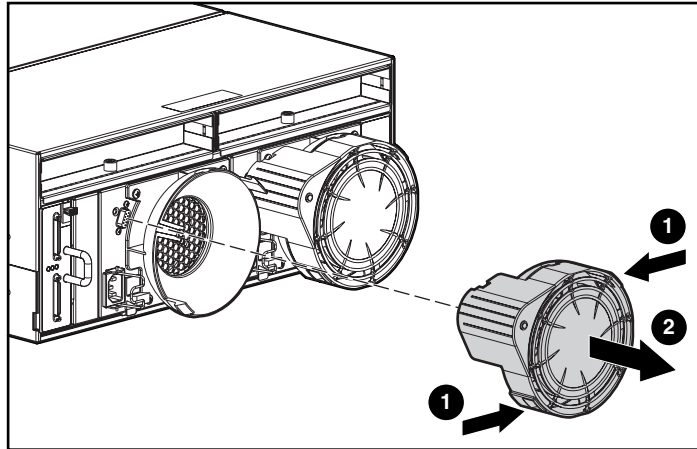
Blower

To remove the component:



WARNING: The blower blades rotate at a high speed. Avoid touching the rotating blades when removing the blower.

NOTE: The power supply is designed so that removing a blower does not adversely affect system performance. However, do not remove a blower until the replacement blower is available.



To replace the blower:

1. Align the guidepost on the blower with the connector on the power supply.



CAUTION: Do not press on the center section of the blower because this action can damage the blades. Press only on the outer edge of the blower.

2. Slide the blower into the connector until it locks into place.
3. Be sure the following conditions occur:
 - The blower begins operating immediately.
 - The power supply/blower assembly LED is green.

Hot-Plug Power Supply

Observe the following cautions for AC power supplies:



CAUTION: Removing a power supply significantly changes the airflow within the enclosure. The system will shut down to prevent overheating unless the power supply is replaced within 5 minutes.



CAUTION: Handle the blower carefully to avoid damaging the housing.

- Do not press on the center section of the blower because this action can damage the blades. Press only on the outer edge of the blower.
- Do not rest the power supply on the blower because the weight of the power supply can damage the blower housing.

Observe these additional warnings and cautions for DC power supplies:



WARNING: A risk of personal injury from electric shock and hazardous energy levels exists. The installation of options and routine maintenance and service of this product must be performed by individuals who are knowledgeable about the procedures, precautions, and hazards associated with DC power products.



WARNING: To reduce the risk of electric shock, fire, and damage to the equipment, this product must be installed in accordance with the following guidelines:

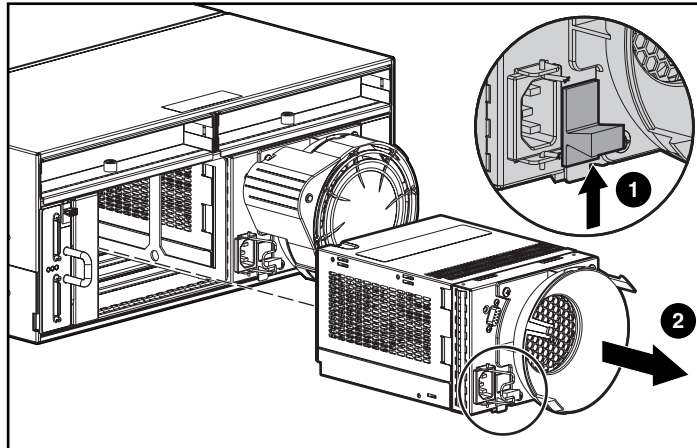
- This power supply is intended only for installation in HP equipment located in a restricted access location.
- This power supply is not intended for direct connection to the DC supply branch circuit. It should be connected to a power distribution unit (PDU) that provides an independent overcurrent-protected output for each DC power supply. Each output overcurrent-protected device in the PDU must be suitable for interrupting fault current available from the DC power source and must be rated no more than 20A.
- This power supply is designed to be connected only to a DC power source that can be classified as SELV or TNV, in accordance with applicable national requirements for Information Technology Equipment and Telecommunications Equipment. Generally, these requirements are based on the International Standard for Information Technology Equipment, IEC 60950, and/or the European Telecommunication Standard ETC 300 132-2. The DC source is to have one pole (Neutral/Return) reliably connected to earth ground in accordance with local/regional electric codes and/or regulations.
- The green/yellow cable of the power cord assembly must be connected to a suitable ground/earth terminal located within the rack or cabinet. This terminal must be connected to a suitable building ground/earth terminal in accordance with local/regional electric codes/regulations. Do not rely on the rack or cabinet chassis to provide adequate ground/earth continuity.



CAUTION: Do not operate the storage system with one AC power supply and one DC power supply installed.

To remove the component:

1. Disconnect the power cord from the power supply.
2. Remove the blower. Refer to “Blower” in this chapter.
3. Remove the power supply.



To replace the power supply:

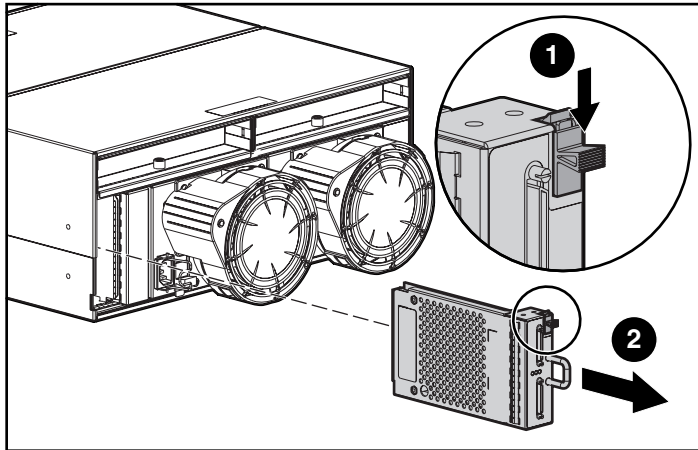
1. Lift the locking latch.
2. Slide the power supply into the bay until it locks into place.
3. Install the blower on the power supply.
4. Connect the power cord.

If you are replacing AC power supplies with DC power supplies, refer to the *DC Power Supply Option Installation Instructions* that ship with the option.

2-Port and 4-Port Shared Storage Modules

To remove the component:

1. Power down the system. Refer to “System Power Down” in this chapter.
2. Disconnect the SCSI cabling connected to the 2-Port Ultra3 SCSI I/O module.
3. Remove the module.



To replace the component, reverse the removal procedure.

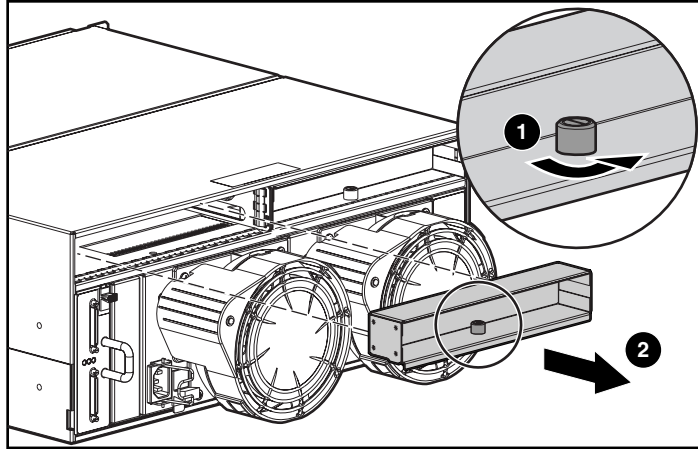
If you are replacing a failed 2-Port Shared Storage Module with a 4-Port Shared Storage Module, refer to the *4-Port Shared Storage Module Installation Instructions* that ship with the option.

Interconnect Blank

To remove the component:



CAUTION: Always populate interconnect bays with a blank. Proper airflow can only be maintained when the bays are populated. Operating the system with unpopulated bays can lead to improper cooling and thermal damage.



To replace the component, reverse the removal procedure.

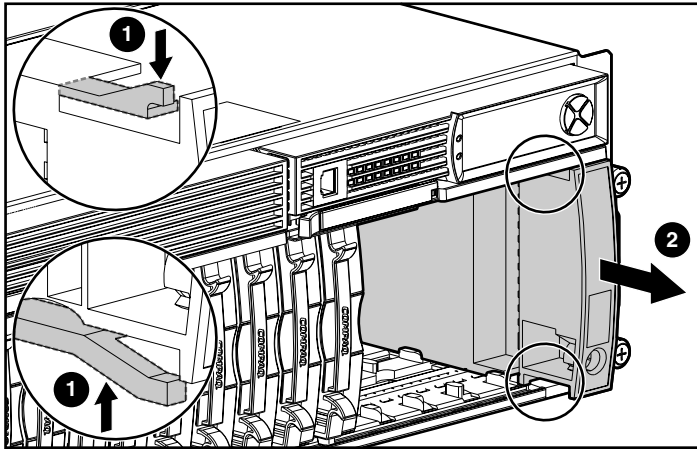
Power Button/LED Assembly

To remove the component:

1. Power down the system. Refer to “System Power Down” in this chapter.
2. Remove the hot-plug SCSI hard drives in bays 10 through 14. Refer to “Hot-Plug SCSI Hard Drive” in this chapter.

IMPORTANT: To press the plastic latches behind the front bezel, you may choose to use a flat-head screwdriver.

3. Remove the power button/LED assembly:



To replace the component, slide the power button/LED assembly into the bay until it locks into place.

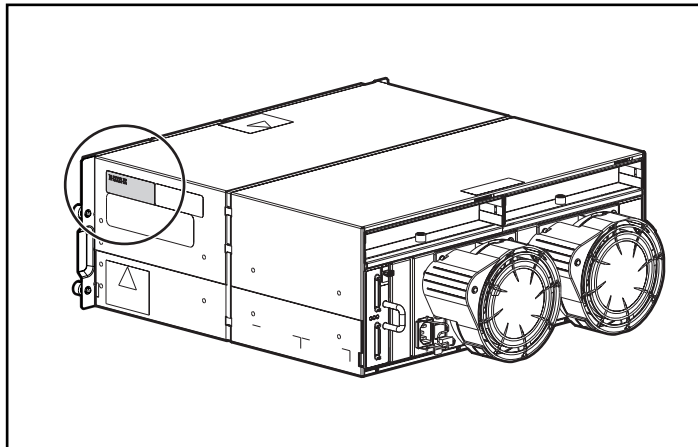
MSA500 System Chassis and Backplane

If the backplane board fails or the chassis sustains significant damage, you must order a replacement chassis.

To replace the chassis and backplane:

1. Power down the system. Refer to “System Power Down” in this chapter.
2. Remove all installed hard drive blanks. Refer to “Hard Drive Blank” in this chapter.
3. Remove all installed hot-plug SCSI hard drives. Refer to “Hot-Plug SCSI Hard Drive” in this chapter.
4. Remove the Universal Hot-Plug Tape drive, if installed. Refer to “Universal Hot-Plug Tape Drive” in this chapter.
5. Remove the bezel blank. Refer to “Bezel Blank” in this chapter.
6. Remove the controllers. Refer to “HP StorageWorks Modular Smart Array 500 Controller” in this chapter.
7. Remove the power supplies. Refer to “Hot-Plug Power Supply” in this chapter.
8. Remove the 2-Port or 4-Port Shared Storage module. Refer to “2-Port and 4-Port Shared Storage Modules” in this chapter.
9. Remove the interconnect blanks. Refer to “Interconnect Blank” in this chapter.
10. Remove the power button/LED assembly. Refer to “Power Button/LED Assembly” in this chapter.
11. Handwrite the serial number of the original chassis on the label on the replacement chassis, shown in the following figure.

IMPORTANT: Always keep the serial number of the original chassis for warranty validation purposes.



12. Install all the removed components in the new chassis. To replace each component, refer to the procedures in this chapter.

Diagnostic Tools

Server Utilities

HP utilities provide reporting functions that enable event-focused management and diagnostics. To install and run these utilities, refer to the server documentation.

- **Diagnostics Utility**—This utility tests and verifies proper operation of the system hardware. If problems are found, the utility isolates failure(s) down to the replaceable part, whenever possible. When an operating system is installed with SmartStart Version 5.30 or later, the Diagnostics and utilities are installed on a partition of the hard drive that contains the operating system. (This hard drive may or may not be located in the storage system.) Always access these utilities when a system configuration error is detected during POST.
- **INSPECT Utility**—This utility provides a report detailing system information.
- **Insight Manager 7**—This Web-based application enables system administrators to accomplish normal administrative tasks from any remote location, using a Web browser. Insight Manager 7 provides device management capabilities that consolidate and integrate management data from HP and third-party devices.
- **Insight Management Agents**—These agents enable easy manageability of the server through Insight Manager 7 software and third-party SNMP management platforms. Management agents monitor key subsystems that are instrumental in making health, configuration, and performance data available to the agent software. The agents act upon that data by initiating alarms in the event of faults. The agents also provide updated management information, such as network interface or subsystem performance statistics, to the management systems.
- **Survey Utility**—This utility gathers critical hardware and software information on servers running Microsoft® Windows® and Novell NetWare operating systems. If a significant change occurs between data-gathering intervals, the Survey Utility marks the previous information and overwrites the Survey text files to reflect the latest changes in the configuration.

ROM Upgrades

Each MSA500 controller has a ROM that contains the controller firmware.

The ROM flash tool enables system administrators to efficiently upgrade array controller ROM images. This tool has the following features:

- Supports Microsoft Windows NT® 4.0, Windows 2000, Novell NetWare (offline only), and Linux operating systems
- Integrates with other software maintenance, deployment, and operating system tools
- Automatically checks for hardware, firmware, and operating system dependencies, and installs only the correct ROM upgrades required by each target controller

For firmware procedures, refer to the SmartStart CD.

Array Diagnostics Utility

ADU collects all possible information about the array controllers in the system and generates a list of detected problems. You can save this data to a file for analysis. In most cases, ADU provides sufficient information for troubleshooting procedures.

To obtain ADU, download the utility from the HP website:

www.hp.com

Array Configuration Utility

ACU Version 6.0 (or later) is a browser-based utility with the following features:

- Supports online array capacity expansion, logical drive capacity extension, assignment of online spares, and RAID or stripe size migration
- Suggests the optimum configuration for an unconfigured system
- Provides different operating modes, enabling faster configuration or greater control over the configuration options
- Remains available any time that the server is on
- Displays on-screen tips for individual steps of a configuration procedure

The minimum display settings for optimum performance are 800 × 600 resolution and 256 colors. The server must have Microsoft Internet Explorer 5.5 (with Service Pack 1) installed and be running Microsoft Windows 2000, Windows NT 4.0, or Linux. Refer to the *README.TXT* file for further information about browser and Linux support.

For more information about ACU Version 6.0 (or later), refer to the *HP Array Configuration Utility User Guide* on the Documentation CD.

NetWare Online Array Configuration Utility (CPQONLIN)

The NetWare Online Array Configuration Utility, also called CPQONLIN, is a NetWare Loadable Module (NLM) for configuring drive arrays without shutting down the server. CPQONLIN also provides information about the status of drives attached to the MSA500 controller. It indicates drive failure, expansion, or waiting for expansion or rebuild (queued).

For more NetWare Online Array Configuration Utility information, refer to the *HP StorageWorks Modular Smart Array 500 System User Guide* or the *HP Array Configuration Utility User Guide* on the Documentation CD.

Component Identification

Front Panel Components

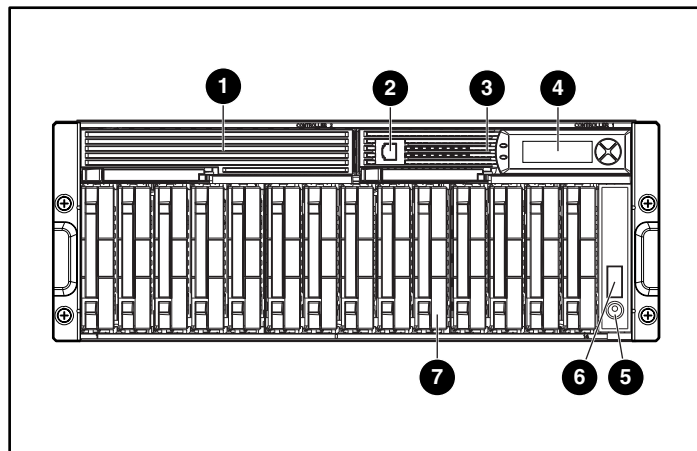


Table 4-1: Front Panel Components

Item	Description
1	Bezel blank (bay for optional redundant controller)
2	Service port (for HP service technicians only)
3	Hot-plug MSA500 controller
4	Controller display
5	Power On/Standby button
6	Enclosure LEDs (refer to Table 4-2)
7	Hot-plug SCSI hard drive bays with blanks

Enclosure LEDs

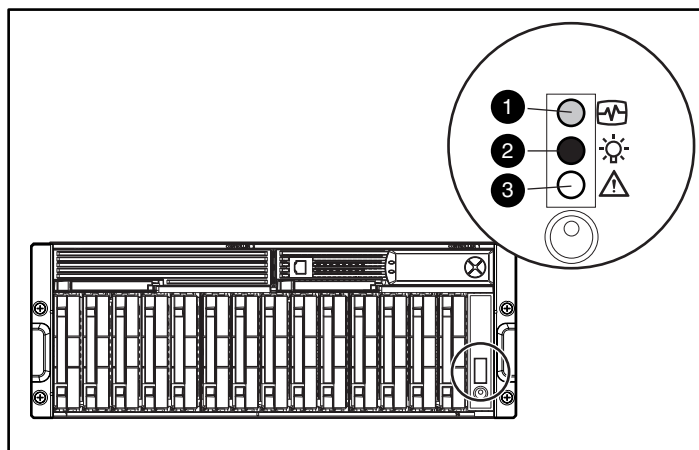


Table 4-2: Enclosure LEDs

Item	LED Description	Status
1	Environmental Monitoring Unit (EMU) heartbeat	Green flashing = Shared storage module is operating normally. Green/Off = Shared storage module is not operating normally.
2	System power	Green = System power is On. Off = System is in standby mode or power is removed from the system.
3	Fault	Amber = Fault detected in a subsystem Off = No faults detected

IMPORTANT: The Power On/Standby button does not remove all power from the system. The Standby mode removes power from most of the electronics and the drives, but portions of the power supply and some internal circuitry remain active. To remove power completely, disconnect all power cords from the equipment.

Rear Panel Components

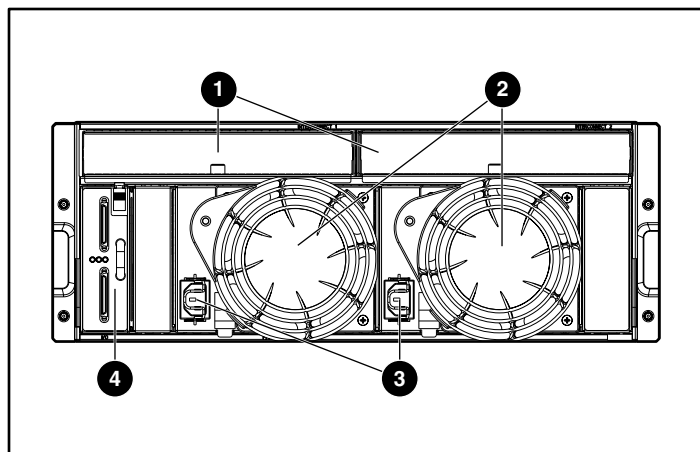
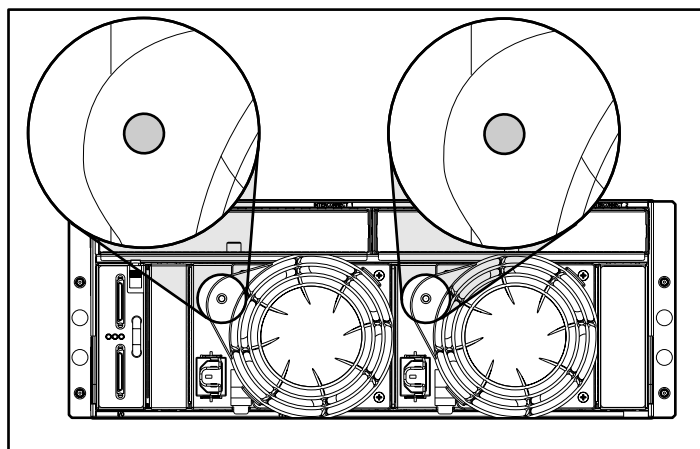


Table 4-3: Rear Panel Components

Item	Description
1	Interconnect blanks (Required for proper airflow)
2	Power supply/blower assemblies
3	AC power connectors
4	2-Port Shared Storage Module

Power Supply/Blower Assembly LEDs



The power supply/blower assembly LEDs have the following functions:

- Green—The power supply is receiving power, and the blower is operating normally.
- Off—No power is present; the power supply or the blower has failed.

2-Port Shared Storage Module Components

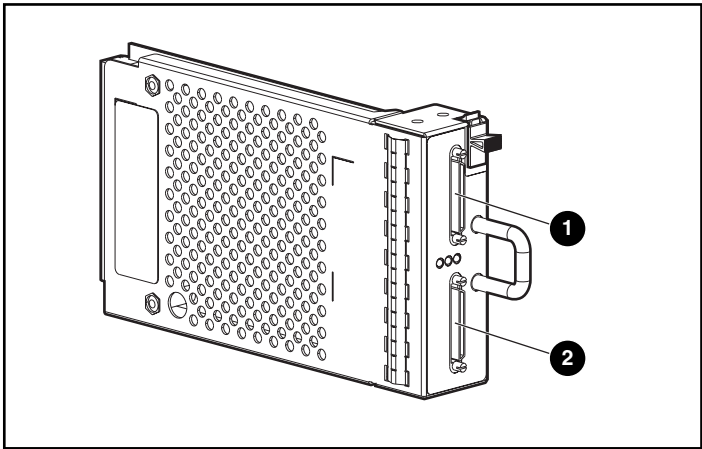


Table 4-4: 2-Port Shared Storage Module Components

Item	Connector Description	Bus
1	SCSI port connector	A
2	SCSI port connector	B

2-Port Shared Storage Module LEDs

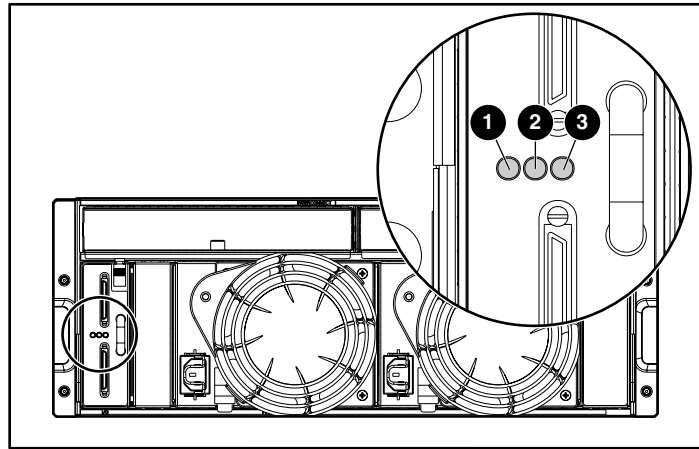


Table 4-5: 2-Port Shared Storage Module LEDs

Item	LED Description	Status
1	Power	Green = Power on Off = Power off
2	SCSI host port A	Flashing green = On/Activity
3	SCSI host port B	Off = Off

4-Port Shared Storage Module Components

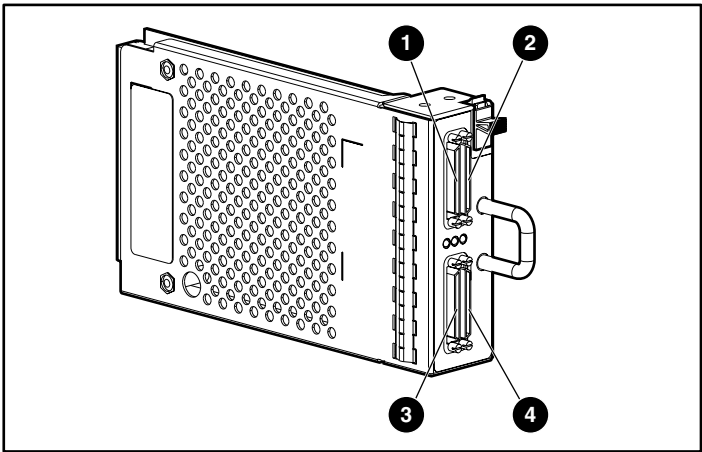


Table 4-6: 4-Port Shared Storage Module Components

Item	Connector Description	Bus
1	SCSI port connector A1	A
2	SCSI port connector A2	
3	SCSI port connector B1	B
4	SCSI port connector B2	

4-Port Shared Storage Module LEDs

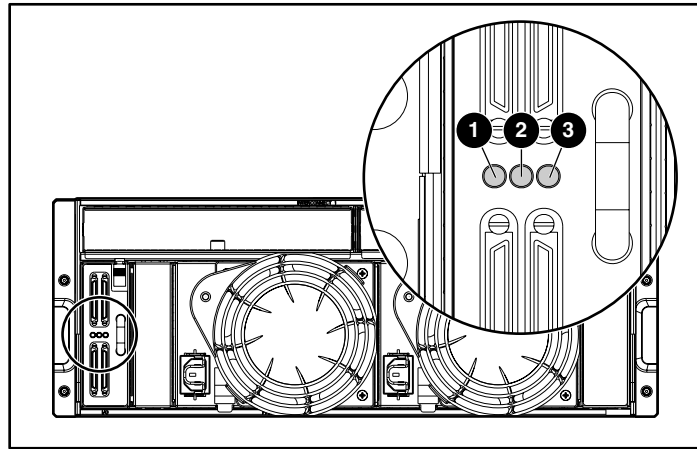


Table 4-7: 4-Port Shared Storage Module LEDs

Item	LED Description	Status
1	Power	Green = Power on Off = Power off
2	SCSI host port A connectors 1 and 2	Flashing green = On/Activity Off = Off
3	SCSI host port B connectors 1 and 2	

Controller Components

Controller Display

Each MSA500 controller has an LCD display for informational and error messages.

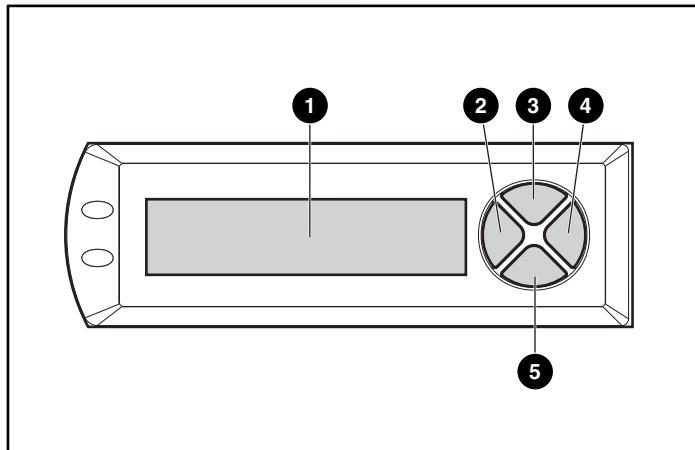


Table 4-8: Controller Display

Item	Description
1	Display
2	Left button
3	Up button
4	Right button
5	Down button

Controller LEDs

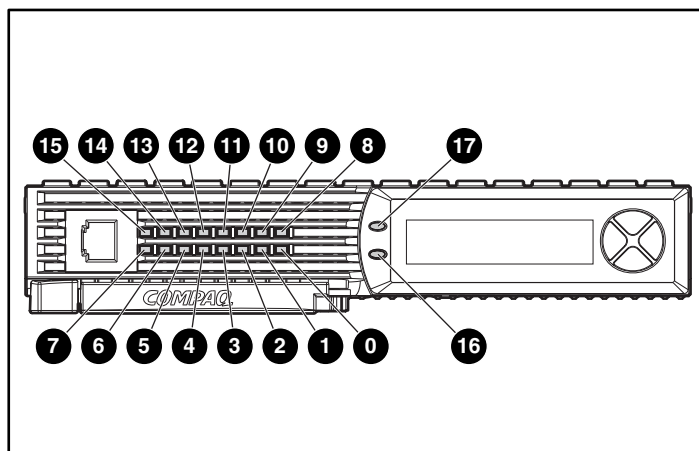


Table 4-9: Controller LEDs

Item	LED Description	Status
0-2	Busy status	Green = Controller is idle. Off = Controller is operating at full capacity.
3-5	No function	—
6	Host port A notification	Green = Notify On Event command active Off = No Notify On Event command active
7	Host port B notification	Green = Notify On Event command active Off = No Notify On Event command active
8	Idle heartbeat	Controller is idle and functioning.
9	Active/Standby	Green = Controller is active. Off = Controller is in standby.
10	DMA activity	Green = DMA transfers are active. Off = No DMA transfers.
11	Logical I/O activity	Green = Currently processing logical requests from the host adapter. Off = No processing of logical requests
12	SCSI bus 0 activity	Green = Outstanding requests on the SCSI bus
13	SCSI bus 1 activity	Off = No outstanding requests

continued

Table 4-9: Controller LEDs *continued*

Item	LED Description	Status
14	Cache activity	Green = Cache activity Off = No cache activity Flashing green = Cache transfer pending
15	Drive failure	Green = An array-configured drive has failed. Off = No drive failures
16	Active redundancy	Green = Controllers are operating with redundancy. Off = No redundancy
17	Fault	Amber = Error message received by controller display. Off = No error message received or no error message currently displayed.

SCSI IDs

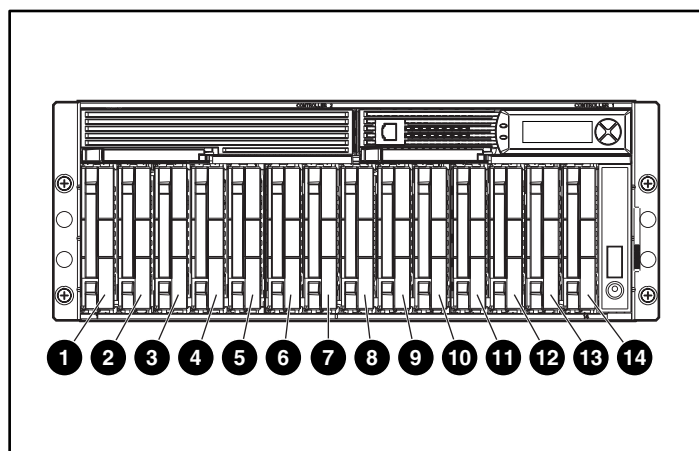


Table 4-10: SCSI IDs

Bay	SCSI ID	Bus Port
1	0	0
2	1	
3	2	
4	3	
5	4	
6	5	
7	8	
8	0	1
9	1	
10	2	
11	3	
12	4	
13	5	
14	8	

Hot-Plug SCSI Hard Drive LEDs

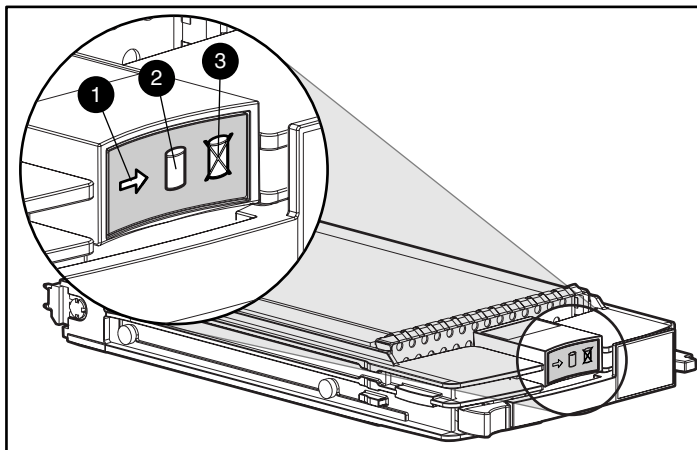


Table 4-11: Hot-Plug SCSI Hard Drive LEDs

Item	LED Description
1	Activity
2	Online
3	Fault

Hot-Plug SCSI Hard Drive LED Combinations

Table 4-12: Hot-Plug SCSI Hard Drive LED Combinations

Activity LED	Online LED	Fault LED	Status
On	Flashing	Off	Do not remove the drive. Removing a drive during this process can cause data loss in non-fault-tolerant configurations <ul style="list-style-type: none"> The drive is a replacement drive and is being rebuilt or If all online LEDs in a drive array are flashing, an expansion is occurring.
Off	Off	On	OK to replace the drive online. The drive has failed and has been placed offline.
Off, on, or flashing	On	Off	Do not remove the drive. Removing a drive during this process can cause data loss in non-fault-tolerant configurations. The drive is online and configured as part of an array.
Off, on, or flashing	On or Off	Flashing	A predictive failure alert has been received for this drive. Replace the drive as soon as possible.

Specifications

System Unit Specification

Table 5-1: System Unit Specifications

Specification	Value
Dimensions	
Height	17.5 cm (6.9 in)
Depth	52.1 cm (20.5 in)
Width	48.3 cm (19.0 in)
Weight, no drives installed	22.7 kg (50 lb)
Input power requirements * (US and international)	
Rated input voltage	100 to 240 VAC
Rated input frequency	50 to 60 Hz
Rated input current	7.35 A Max
Input power (max)	641 W *
Power supply specifications	
Rated steady-state power	499 W
Maximum peak power	681 W
Heat dissipation (max) *	2187 Btu/hr *
Acoustic noise (LWAdc bels and LpAm dBA)	
Idle	<6.9 and 53
Fixed disk (random writes)	<7.3 and 54
Temperature range	
Operating	10° to 35° C (50° to 95° F) [derated 1°C per 304.8 m (1.8°F per 1000 ft) of elevation to 3,048 m (10,000 ft)]
Shipping	-30° to 50° C (-22° to 122° F)
* Input power and heat dissipation specifications are maximum values and apply to worst-case conditions at a full-rated power supply load. The power/heat dissipation for your installation varies depending on the equipment configuration.	

continued

Table 5-1: System Unit Specifications *continued*

Specification	Value
Relative humidity (noncondensing)	
Operating	10% to 90%
Nonoperating	up to 95%
Maximum wet bulb temperature	
Long-term storage	29°C (84.2°F)
Short term storage	30°C (86°F)

Memory

Table 5-2: SDRAM DIMM Specifications

Specification	Value
Speed	100 MHz minimum
Width	80 bits
Note: Use only HP battery-backed cache modules.	

2-Port and 4-Port Shared Storage Modules

Table 5-3: 2-Port and 4-Port Shared Storage Module Specifications

Specification	Value
Height	11.4 cm (4.5 in)
Width	3.5 cm (1.38 in)
Depth	24.1 cm (9.5 in)
Weight	0.6 kg (1.3 lb)

Hot-Plug AC Power Supply

Table 5-4: Hot-Plug Power Supply Specifications

Specification	Value
Height	12.7 cm (4.5 in)
Width	15.9 cm (6.25 in)
Depth	24.1 cm (9.5 in)
Weight	2.9 kg (6.4 lb)

Note: The MSA500 system power supply specifications are calculated without the blower.

Hot-Plug DC Power Supply

Table 5-5: Hot-Plug DC Power Supply Specifications

Specification	Value
Voltage	
Nominal input voltage	-48 or 48 VDC
Maximum input voltage	75 VDC
Operating voltage range	36 to 72 VDC
Ripple/Noise	100 mV PARD*
Overshoot	Must remain within regulation limits during startup or shutdown
Current	
Max steady state input current	13.2 A
In-rush current	70 A
Input over-current	Customer must provide fusing for facility DC feeds that protect the system from catastrophic over-current within 20 μ S. Fuse should sustain all in-rush and operating currents.
Max input current slew rate	1A/ μ S
Max rated power	499 W

*Periodic and random noise (PARD). Maximum allowable peak-to-peak ripple and noise (as measured at the load on any output channel). The ripple and noise is measured over a 20 Hz to 100 MHz frequency band.

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